What is claimed is:

1. An electron emitter characterized by:

a substance serving as an emitter made of a dielectric material, and a first electrode and a second electrode to which a drive voltage is applied to emit electrons;

said first electrode being formed on a first surface of the substance serving as the emitter;

said second electrode being formed on a second surface of the substance serving as the emitter;

at least said first electrode having a plurality of through regions through which said substance serving as the emitter is exposed, said first electrode having a surface which faces said substance serving as the emitter in peripheral portions of said through regions and which is spaced from said substance serving as the emitter.

2. An electron emitter according to claim 1, characterized in that at least said first surface of said substance serving as the emitter has surface irregularities due to the grain boundary of the dielectric material, said through regions of the first electrode are formed in regions corresponding to concavities of the surface irregularities due to the grain boundary of the dielectric material.

3. An electron emitter according to claim 1, characterized in that a maximum angle θ between said first

surface of said substance serving as the emitter and said surface of the first electrode which faces said substance serving as the emitter in peripheral portions of said through regions is in the range of $1° \leq \theta \leq 60°$.

4. An electron emitter according to claim 1, characterized in that a maximum distance d in the vertical direction between said first surface of said substance serving as the emitter and said surface of the first electrode which faces said substance serving as the emitter in peripheral portions of said through regions is in the range of $0\ \mu m \leq d \leq 10\ \mu m$.

5. An electron emitter according to claim 1, characterized in that a floating electrode exists in regions of the first surface of said substance serving as the emitter which correspond to said through regions.

6. An electron emitter according to claim 1, characterized in that said through regions comprise holes.

7. An electron emitter according to claim 6, characterized in that said holes have an average diameter in the range from 0.1 μm to 10 μm.

8. An electron emitter according to claim 1, characterized in that said through regions comprise

recesses.

9. An electron emitter according to claim 8, characterized in that said through regions comprise comb-toothed recesses.

10. An electron emitter according to claim 8, characterized in that said recesses have an average width in the range from 0.1 μm to 10 μm.

11. An electron emitter according to claim 1, characterized in that said through regions comprise slits having an optional shape.

12. An electron emitter according to claim 11, characterized in that said slits have an average width in the range from 0.1 μm to 10 μm.

13. An electron emitter characterized by:

a substance serving as an emitter made of a dielectric material;

a first electrode formed in contact with a first surface of the substance serving as the emitter;

a second electrode formed in contact with a second surface of the substance serving as the emitter; and

at least said first electrode having a plurality of through regions through which said substance serving as the

emitter is exposed;

wherein said electron emitter has, in its electrical operation, between said first electrode and said second electrode:

a capacitor due to said substance serving as the emitter; and

a cluster of capacitors formed said first electrode and said substance serving as the emitter by said through regions of said first electrode.

14. An electron emitter having an electron emission region, characterized in that if the electron emitter changes to a state (first state) in which an amount of positive charges and an amount of negative charges due to the accumulation of electrons caused by applying a negative voltage are in equilibrium with each other, and changes to a state (second state) in which an amount of negative charges is greater than an amount of positive charges due to the accumulation of further electrons, and if the electron emitter changes from said second state to a state (third state) in which an amount of positive charges and an amount of negative charges due to the emission of electrons caused by applying a positive voltage are in equilibrium with each other, and changes to a state (fourth state) in which an amount of positive charges is greater than an amount of negative charges due to the emission of further electrons, then said electron emission has characteristics represented

by:

$$|V1| < |V2|$$

where V1 represents the voltage applied for the electron emitter to change to said first state and V2 the voltage applied for the electron emitter to change to said third state.

15. An electron emitter according to claim 14, characterized in that

$$1.5 \times |V1| < |V2|.$$

16. An electron emitter according to claim 14, characterized in that

if the rate of change of the amount of positive charges and the amount of electrons in the first state is represented by $\Delta Q1/\Delta V1$ and the rate of change of the amount of positive charges and the amount of electrons in the third state by $\Delta Q2/\Delta V2$, then the rates are related to each other by:

$$(\Delta Q1/\Delta V1) > (\Delta Q2/\Delta V2).$$

17. An electron emitter according to claim 14, characterized in that

if a voltage at which the accumulation of electrons is saturated is represented by V3 and a voltage at which the emission of electrons is started by V4, then the voltages are related to each other by:

$1 \leq |V4|/|V3| \leq 1.5$.

18. An electron emitter characterized by:

a substance serving as an emitter made of a dielectric material, and a first electrode and a second electrode to which a drive voltage is applied to emit electrons;

wherein if a voltage applied in one direction between said first electrode and said second electrode to change the electron emitter from a state in which said substance serving as the emitter is polarized in one direction to a state in which the polarization is inverted is referred to as a first coercive voltage v1, and a voltage applied in another direction to change the polarization back in said one direction from said last-mentioned state is referred to as a second coercive voltage v2, then the voltages are related to each other by:

$v1 < 0$ or $v2 < 0$, and

$|v1| < |v2|$.

19. An electron emitter according to claim 18, characterized in that

$1.5 \times |v1| < |v2|$.

20. An electron emitter according to claim 18, characterized in that

if the rate of change of the polarization when said first coercive voltage is applied is represented by $\Delta q1/\Delta v1$,

and the rate of change of the polarization when said second coercive voltage is applied by $\Delta q2/\Delta v2$, then the rates are related to each other by:

$$(\Delta q1/\Delta v1) > (\Delta q2/\Delta v2).$$

21. An electron emitter according to claim 18, characterized in that

if a voltage at which the accumulation of electrons is saturated is represented by v3 and a voltage at which the emission of electrons is started by v4, then the voltages are related to each other by:

$$1 \leq |v4|/|v3| \leq 1.5.$$